DOCUMENT RESUME

ED 181 048 TM 009 939

AUTHOR Garner, William T.
TITLE Linking School Resources to Educational Outcomes: The Role of Homework.
INSTITUTION Columbia Univ., New York, N.Y. Horace Mann - Lincoln Inst. for School Experimentation.
PUB DATE Nov 78
NOTE 12p.
JOURNAL CIT HMLI Research Bulletin: v19 n1 Nov 1978

EDRS PRICE MF01/PC01 Plus Postage.
DESCRIPTORS *Academic Achievement; Educational Resources; Elementary Secondary Education; Family Influence; *Homework; *Student Ability; *Success Factors; Surveys; *Teacher Attitudes; Technical Reports; *Time Factors (Learning)

ABSTRACT

Homework assignments are viewed as a kind of resource allocation which should be included in assessing a school's educational resources. Three questions are addressed in this study: average time allocations for student exposure to learning resources in class, through homework, and in total; extent of the variations in these averages; and relationship of the variations to student ability. Data are based on survey responses of mathematics and reading-language arts teachers in grades 5, 8, and 10, in New York City and Connecticut. It is concluded that student opportunity to learn and time allotted to subject matter varies; larger variations are found in time allocated to homework; these variations are related to teachers' reports of the average ability levels of classes. Higher ability calsses, as perceived by teachers, are given more exposure to school learning activities. At upper grades, more homework is assigned and learning-related activities are shifted from the classroom to the home. To the extent that student achievement is positively related to home influences, the expected effect of assigning more homework to more able students increases the influence of home background on academic achievement. (MH)

****
* Reproductions supplied by EDRS are the best that can be made *
* from the original document. *
****

RESEARCH BULLETIN

Horace Mann—Lincoln Institute

U.S. DEPARTMENT OF HEALTH, EDUCATION & WELFARE
NATIONAL INSTITUTE OF EDUCATION

THIS DOCUMENT HAS BEEN REPRODUCED EXACTLY AS RECEIVED FROM THE PERSON OR ORGANIZATION ORIGINATING IT. POINTS OF VIEW OR OPINIONS STATED DO NOT NECESSARILY REPRESENT OFFICIAL NATIONAL INSTITUTE OF EDUCATION POSITION OR POLICY

Vol. 19, No. 1 November, 1978

ED181048

Linking School Resources To Educational Outcomes The Role Of Homework

"PERMISSION TO REPRODUCE THIS MATERIAL HAS BEEN GRANTED BY William T. Garner

TO THE EDUCATIONAL RESOURCES INFORMATION CENTER (ERIC)."

by William T. Garner

The loose connection between school resources and student outcomes continues to puzzle education researchers and frustrate policy makers. While student ability and family background variables show strong and consistent relations to student achievement, there is a troubling lack of systematic pattern in the relation of school variables to achievement. Class size, for example, is a school variable closely related to the level of expenditure in a district. To make classes smaller, additional teachers must be hired, thus raising expenditure per pupil in a school. Yet class size does not by itself, or in combination with other commonly studied school variables, show a strong or consistent relation to student achievement. [1]

Findings of this kind have led to a renewed emphasis on detailed studies of classrooms and teachers in action. It is not enough to know class size and teacher experience. What is actually happening in the class? What is the teacher doing? More important, what are the students doing? Answering these questions might show where the links between resources and results are tightest, and where they are slack.

Efforts to answer these questions have shown **student time on task** to be an important variable relating to student achievement. While it is not surprising that the production of education outcomes depends in part on the time allocated to and spent on learning activities, the importance of this fact had been overlooked for some years.[2] One solid advantage of knowing both student time on task and student achievement is that school resources or learning activities can be compared to determine their effectiveness in reducing the time students need to learn specific tasks or material or in promoting achievement in a given amount of time.

Studies have examined the differences in young children's exposure to learning activities **prior to** entering school and have found that the amount and quality of that exposure have considerable effects on subsequent student achievement.[3] In addition, a steadily mounting body of research is confirming the importance of how time is spent **in school.**[4] Until now, however, little attention has been given to a familiar learning activity which can markedly affect a student's total learning exposure: **homework.** Most teachers give students homework assignments to be completed outside of regular class time. This paper reports new data on student learning exposure, looking at both class and homework time allocations in over 400 fifth, eighth, and tenth grade classrooms.

A student's exposure to instructional materials and activities by homework can be a large share of total learning time. For example, thirty minutes of homework constitutes a 50% extension of a one-hour class. The share of total learning time devoted to homework increases from grade to grade. By tenth grade, homework accounts on the average for almost one-half of all school-regulated learning activity in the subjects studied here. Thus, the higher the grade level, the

TM009 939

1. Dean Jamison, Patrick Suppes, and Stuart Wells, "The Effectiveness of Alternative Instructional Media: A Survey," **Review of Educational Research**, 44 (Winter, 1974), 1-67.

ABOUT THE AUTHOR: William T. Garner is an Assistant Professor in the Department of Educational Administration, Teachers College, Columbia University. He has also taught at Northwestern University and at universities in British Columbia and Montreal, Canada. Professor Garner is particularly interested in educational cost-effectiveness, and in improving the connections between resources and results in schooling. In addition to the work reported here, he is also engaged in a study of private secondary schools, and is writing a book on **The Economics of Educational Settings.**

2. Some studies in the 1930's pertaining to the use of time in school are discussed by Philip W. Jackson, **Life in Classrooms** (New York: Holt, Rinehart, and Winston, 1968). Other studies over the past fifty years are described in William T. Garner, "Time in Learning and Schooling," **MSSC Exchange** XXXV, Nos. 4 & 5 (1976-77).

3. See Peter R. Moock, "Education and the Transfer of Inequality from Generation to Generation" **Teachers College Record** 79 (May, 1978): 737-748.

4. See, for example, Barak Rosenshine and David C. Berliner, "Academic Engaged Time," paper presented at the annual meeting of the American Educational Research Association, 1977. Also see David C. Berliner "Successful Classroom Teaching and Learning" paper presented at the Meeting of the Educational Forum, Washington, D.C., November, 1978.

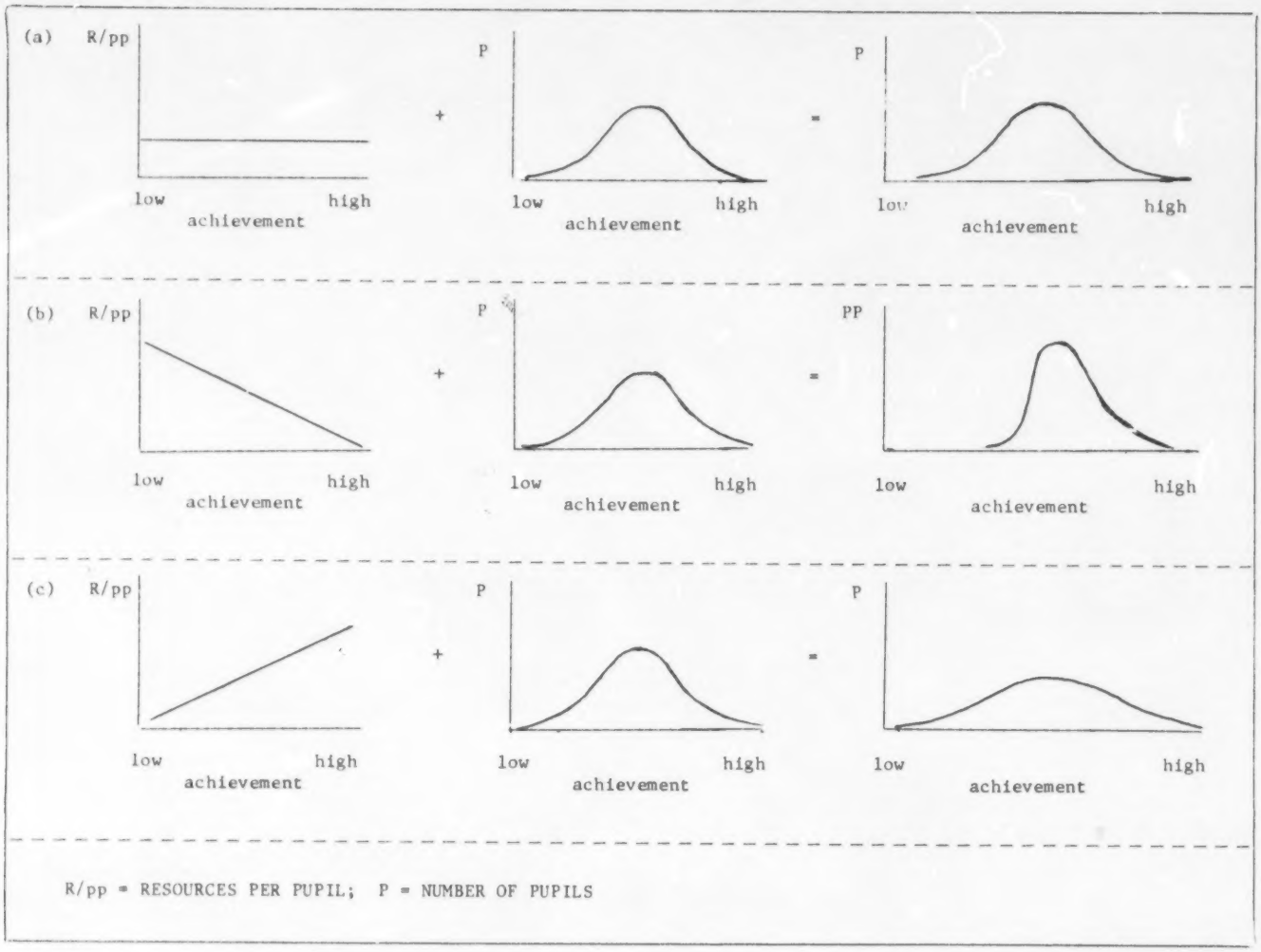

Figure 1. Three resource allocation models.

more teachers rely on homework to extend the student's class time exposure to learning materials. Moreover, after 5th grade, most schools are "departmentalized": each subject has a specialist teacher. Time in departmentalized subjects is regulated by the division of the school day into periods. Therefore, variations in students' total learning exposure are due increasingly to variations in homework assignments. As will be shown, these variations are large and systematic: more able students are assigned more out of school learning activities.

The assumption underlying this study is that the impact of resources purchased by schools cannot be properly assessed unless differences in student exposure to learning activities, both in and out of school, are taken into account. Theoretically, the impact of resources on student achievement depends on both the amount and quality of resources, and the student's initial level of achievement. Figure 1 below shows three ways resources per pupil might be allocated with respect to initial student achievement, and the expected impact these different allocation practices would have on subsequent student achievement.

If, as model (a) suggests, the allocation of resources to pupils is uniform with respect to prior achievement, then, in the simplest case,[5] the average level of achievement may rise, but the distribution of achievement remains the same and the low achiever is still a low achiever. If, as model (b) indicates, more resources are directed to lower achieving students and relatively less to higher achieving students, schools might bring up lower achievers and narrow the distribution of achievement. Finally, if, as model (c) depicts, more resources are allocated to higher achieving pupils and relatively less to lower achieving pupils, the distribution of achievement widens from one grade to the next.

The view taken here is that homework assignments are another kind of resource allocation: an allocation of the student's own time. Such assignments are a hidden resource allocation, easily overlooked and often omitted from discussions of schooling resources. But, although student time is not purchased, it is allocated by schools and by teachers, and must be included in attempts to assess the educational value of resources which are purchased. The data presented here establish the relative magnitude and potential importance of homework time as a learning

5. The simplest case is that in which there is no differential impact of resources on students of different prior achievement or ability, and all relations are linear and additive. This is perhaps an oversimplification, since in all likelihood, higher achieving students use any given resources more effectively than do lower achievers. All models in Figure 1 are for the simplest case.

resource by addressing three questions.

I. What are the average allocations of time for student exposure to learning resources in class, through homework, and in total?

II. How large are the variations around these averages?

III. Are the variations related to student ability?

Theoretical Background

Perhaps the two most influential studies on the transformation of school resources into student outcomes have been the **Equality of Educational Opportunity** survey (the "Coleman Report"),[6] and John Carroll's "Model of School Learning."[7] The Coleman Report summarized an empirical study of impressive scale: a nationwide survey of over 4,000 schools. A portion of the report analyzed the survey data according to a model in which educational outcomes are correlated with sets of family, community, school, and student characteristics. Although the Coleman Report did not, strictly speaking, assess the impact of resources on achievement gain, it drew fresh attention to the question of how resources are related to achievement. Research stimulated by the Coleman Report permits three observations relevant to this study.

A) The distribution of inputs and outputs is as important as their mean levels. Students do not all have the same talents and backgrounds; neither are they equally exposed to school resources. Studies which examine only mean levels of resources and outcomes may obscure important distributional facts or effects relating to who gets what and with what result.[8]

B) Classrooms and students should be units of analysis, not just the school, because it is in classrooms that students are exposed to instructional resources and activities.[9] In addition, it has been pointed out that students, not schools, produce achievement gains.[10]

C) Learning in school is not an instantaneous event: it is the result of processes that take place over time. Thus, it is the actual availability and use of resources over time that must be studied, not just their quantity or stock at some moment.[11]

John Carroll's "Model of School Learning," although perhaps not as widely known as the Coleman Report, has been influential in the study of the production of learning gains. Carroll's model holds that the amount a student learns depends on five factors.

1) Aptitude: the amount of time needed to learn the task under optimal instructional conditions.
2) Ability to understand instruction.
3) Perseverance: the amount of time the learner is willing to engage actively in learning.
4) Opportunity: time allowed for learning.
5) Quality of instruction: the degree to which instruction is presented so that it will not require additional time for mastery beyond that required in view of aptitude.

Two of these factors (time made available and quality of instruction) are directly under the control of school personnel. Of the remaining factors, the student's perseverance or "motivation" is normally thought to be amenable to some influence by teachers. Only student aptitude and ability to understand instruction are, in Carroll's model, outside of school influence. But even these, to the extent they reflect prior achievement and instructional exposure, may in the long run be modified by schooling.

The importance of Carroll's focus on the relation of time and learning was noted by Benjamin Bloom in his 1973 Thorndike Award address to the American Psychological Association:

> In setting **time** as the central variable in school learning, Carroll produced a major shift in our thinking about education and educational research. If teachers and curriculum makers can define an appropriate criterion of achievement, then it becomes the responsibility of the teachers and the schools to provide the time necessary for the students to attain the criterion. If time is the central variable and the necessary time is provided, then the attainment of the criterion is possible for all students who can be motivated to use the time they need.[12]

Thus, both the Coleman Report and Carroll's "Model of School Learning" have led to an increased emphasis on time as a metric for describing and analyzing educational processes.

This pronounced role for "time" as a metric is due in no small part to the convenient measurement properties of elapsed time. There are many advantages to using time as a metric.[13]

a) Measured time has all the properties and statistical advantages of a ratio scale: a "natural" zero; ordinality; uniform intervals; and equality of ratios.[14]

b) Natural and social facts make time a finite quantity. Social convention and the cycles of light and dark make our days, weeks, and years consist of finite numbers of hours. This property, together with that of being on a ratio scale, makes time fit perfectly the model of "zero-sum" situations: time spent one way is not available to be spent another; the total number of hours in any one day must equal twenty-four for all individuals. Thus, concepts such as "value", "substitution," "efficiency", and "productivity" can be given unambiguous definitions in terms of time.

c) All concepts of causality are referred to the sequence of events over time: consequences never precede causes. Establishing time sequence is necessary in any study of causal connections.

d) Some qualitative concepts may be operationalized as conjoint quantities, at least one of which is measured time. For example, "intensity" may be operationalized as time with particular resources, or in particular settings.

e) "Perception of time" and "value of time" are recognized phenomena in social-psychological and cultural studies. Differences in values and subjective judgments about time are assessed by reference to a standard time metric.[15]

---

6. James S. Coleman et al., **Equality of Educational Opportunity** (Washington, D.C.: U.S. Government Printing Office, 1966).

7. John B. Carroll, "A Model of School Learning," **Teachers College Record** 64 (May, 1963): 723-733.

8. Cf. Byron Brown and Daniel Saks, "The Production and Distribution of Cognitive Skills Within Schools," **Journal of Political Economy** 83 (1975), 571-593.

9. Rebecca Barr and Robert Dreeben, "Instruction in Classrooms," Chapter 3 in Lee S. Shulman, ed., **Review of Research in Education**, Vol. 5 (1977) (Itasca, Ill.: F.E. Peacock, 1978).

10. J. Alan Thomas, "Resource Allocation in Classrooms," Report on N.I.E. Project No. 4-0794, N.I.E. G74-0037 (University of Chicago: Education Finance and Productivity Center, 1978).

11. William T. Garner, "The Identification of an Educational Production Function by Experimental Means," unpublished Ph.D. dissertation, University of Chicago, 1973. For a discussion of additional insights gained since the Coleman Report, see Gary R. Bridge, Charles H. Judd, and Peter R. Moock, **The Determinants of School Achievement** (Cambridge, Mass.: Ballinger, 1978).

12. Benjamin S. Bloom, "Time and Learning," **American Psychologist** 29 (September, 1974), 682-688.

13. The following five paragraphs are adapted from a memorandum on "Time as a Metric" by the author to the Division of School Finance and Organization, National Institute of Education, December 15, 1977.

14. S.S. Stevens, "On the Theory of Scales of Measurement," **Science** 103 (June 7, 1946), 677-680.

15. Cf. Sebastian de Grazia, **Of Time, Work, and Leisure** (New York: Twentieth Century Fund, 1962); Fraser, ed., **The Voices of Time** (New York: George Braziller, 1966).

In this paper, allocated time is taken to indicate, as Carroll proposed, "opportunity to learn." The time teachers devote to subject matter is a measure of students' opportunity to learn that subject. It is of course true that other factors influence the amount students learn, but each factor or condition thought to be influential must have some time period in which to bring about its effects. [16]

Unique to this study is the inclusion of school-regulated, out-of-class time — time allocated in the form of homework assignments — in the estimation of the student's total opportunity to learn. The potential importance of homework assignments as a resource allocation depends on a number of considerations. The quality and educational soundness of homework assignments, as well as their quantity, may vary greatly. Some students' homes may offer little physical or moral support for a student's homework efforts. For those students whose family circumstances are educationally supportive, homework may constitute a significant positive extension of schooling. Students from homes which are not educationally supportive may receive or do less homework, and thereby have less opportunity to learn. Moreover, the value in learning of any time spent with learning materials is presumably greater in the supportive home. The confluence of such homework differences might be to amplify whatever family background differences were already reflected in achievement, and to diminish the relative impact of strictly school controlled resources.

Sample and Methods

The data reported here consist of survey responses by mathematics and reading-language arts teachers in 45 fifth, 109 eighth, and 173 tenth grade classes in New York City and 13 fifth, 28 eighth, and 79 tenth grade classes in three small towns in Connecticut. [17]

To obtain permission to conduct any study in the New York City schools, one begins at the top, in the Office of Research and Evaluation. Having obtained permission there, one proceeds down through the relevant administrative levels seeking permissions, until the questionnaires are in the hands of teachers. At that point any teacher may, of course, decline to participate. Our initial pool consisted of 10 randomly selected elementary, intermediate, and high schools, for a total of 30 schools. At the elementary and intermediate school levels, the District Superintendent (of which there are 32) must approve the study. It did happen that some districts and individual schools declined to cooperate. Replacement districts and schools were randomly selected and contacted until the final group, totaling 29 schools, including all buroughs except Staten Island, was obtained.

The Connecticut sample was obtained by direct application to schools within a convenient travel radius of one of the project research assistants. Seven schools comprise the Connecticut group.

In view of the voluntary nature of affiliation with this project no claim that a random sample has been obtained is advanced. In particular, it is not clear whether any systematic differences should be expected between teachers or schools which agreed to participate, and those which declined. [18]

After permissions and agreements were secured at the school principal or department chairperson level, arrangements for delivery and pick up of questionnaires were made. Individual teachers still had the option of declining to participate, but agreements with administrators had included an ascertainment by the administrator that some mathematics or reading-language arts teachers would participate. [19] All questionnaires were distributed and collected during May, 1978.

Questionnaire construction required several person-weeks of effort. Different forms were constructed for self-contained and departmentalized instruction. Forms were pilot-tested for readability and clarity of meaning and were reviewed by teachers and administrators for face validity.

Teachers were asked to report their education and teaching experience, and to report on class characteristics and time allocations. Class characteristics included number of students, frequency and length of class meetings, and the "average ability level of this class." Response alternatives for the latter were: "below average," "average," "above average" and "heterogeneous." Preliminary review of the questionnaire with teachers showed that teachers did not hesitate in responding to this item. As it turns out, only 13% of responses lack this information. We preferred not to cite a reference standard (such as national test norms) since it is not the fact of student attainment level we seek to determine, but rather the teacher's beliefs, upon which instructional decisions are presumably based. Moreover, in the locations outside New York City, the actual student achievement scores are available and will be combined with the appropriate teacher's reports.

Teachers were asked to report scheduled class meeting frequency and duration, and to estimate the average amount of time diverted from subject matter to attend to interruptions and non-instructional tasks of all kinds. The class times reported below are based on teacher reports of time devoted strictly to subject matter. The accuracy of such teacher reports of class time allocations has been investigated by Marliave, Fisher, and Filby. In a comparison with class time allocations recorded by trained observers, they found that teachers' estimates of allocated time show "reasonably high correlations" with observer judgments.

Teachers reported the frequency, type, and subsequent treatment (collected, graded, etc.) of homework assignments. Teachers were also asked to report the amount of time they expected students to spend on homework. Such a time expectation was reported for 84% of the classes. We

---

16. It is also true that the amount of time students actually use for learning may be either greater or less than the amount of time teachers allocate. For an analysis of how such differences come about, see Arnegret Harnischfeger and David E. Wiley, "The Teaching-Learning Process: A Synoptic View," **Curriculum Inquiry** 6 (Fall, 1976), 5-43.

17. Data from related studies in a Westchester, New York school system, and three Long Island systems will be incorporated in a later report.

18. A variety of reasons, and sometimes no reason at all, were given by persons declining to participate. Since student responses on a similar questionnaire were also sought, the author was in the awkward position of asking for the diversion of class time to administer a survey about the use of class time. A few school principals specifically cited unwillingness to use class time for non-instructional purposes as a reason for declining to participate.

19. In "self-contained" classrooms, one teacher usually teaches all the academic subjects. New York City 5th grade classrooms are self-contained, for the most part. In the Connecticut schools surveyed, all the 5th grades were "departmentalized."

20. Richard Marliave, Charles W. Fisher, and Nikola N. Filby, "Alternative Procedures for Collecting Instructional Time Data: When Can You Ask the Teacher and When Must You Observe for Yourself?" paper presented at annual meeting of AERA, New York City, April, 1977. (San Francisco: Far West Regional Laboratory for Educational Research and Development).

TABLE 1: WEEKLY CLASS TIME ALLOCATED TO SUBJECT MATTER

	NEW YORK CITY SCHOOLS						CONNECTICUT SCHOOLS					
SUBJECT	MATH			READING/ LANGUAGE ARTS			MATH			READING/ LANGUAGE ARTS		
GRADE LEVEL	5	8	10	5	8	10	5	8	10	5	8	10
# of cases	25	43	84	17	47	66	7	14	37	6	14	42
$\bar{x}$	232.0	169.8	165.6	472.4	173.8	163.5	180.0	171.1	188.8	306.7	208.2	169.3
s.d.	62.0	36.4	25.1	197.9	25.9	16.9	69.9	25.0	39.9	172.0	27.9	23.1
V	.27	.21	.15	.42	.15	.10	.39	.15	.21	.56	.13	.14

$\bar{x}$ = mean class time allocated to subject in minutes

s.d. = standard deviation

V = coefficient of variation

interpret this to mean that teachers adjust the nature of assignments in accordance with their beliefs about the mean time students will take to do the work, and in accordance with a view about how much non-school time students may be expected or requested to spend.

Some teachers, particularly in the 8th and 10th grades, teach more than one class, and returned more than one questionnaire. The New York data set consists of 327 class descriptions by 184 teachers. The Connecticut set consists of 120 class descriptions by 57 teachers. The analyses which follow are at the class level for the most part and use all responses, except where missing information reduces the useable number of cases.

Results

Teachers were asked to indicate how much time was spent, on average, each class meeting on subject matter instruction or activities, after allowing for attendance-taking or interruptions of any kind. These responses were multiplied by the number of times per week the class met, to obtain an estimate of weekly class time spent on subject matter.

Likewise, teachers indicated how often homework was given, and how much time on average they expected students in the class to spend on homework assignments. These responses were multiplied to obtain an estimated weekly homework expectation.

The two estimates were then added together to obtain an estimate of the average weekly total exposure to instructional activities for students in that teacher's class. These results are displayed in Tables 1, 2, and 3, which show for each grade and subject the mean class, homework, and total time allocated, together with the standard deviation and coefficient of variation ($V = s.d./\bar{x}$) for each.

Table 1 shows class times in both subjects are more similar in 8th and 10th grades than in the 5th grade. This is true when comparing the New York City (NYC) with the Connecticut (CONN) schools, as shown by the mean values of class time. It is also true within each of these sets of schools, as shown by the larger coefficients of variation for the 5th grades. The CONN schools are "departmentalized" at 5th grade; i.e. students move from room to room and each subject is taught by a specialist. That may account in part for the smaller averages of reported times in both subjects in 5th grade in CONN as compared to NYC. In both locations, reading-language arts (LA) receives much more class time than does mathematics (Math) at the 5th grade level.

At the 8th and 10th grade levels, these differences between the two locations are all considerably diminished. The absolute amounts of time in each subject are more similar, and the difference between LA and Math time is less pronounced. In both locations, it is LA which shows, in a familiar pattern, the greatest decline in class time from the lower to the upper grades.

Table 2 shows the average homework time expectations teachers reported. The difference in the number of cases between Tables 1 and 2 shows the number of classes in which teachers did not have or did not report an average homework time expectation.[21]

21. Some non-reporting teachers wrote comments indicating they felt their homework practices could not be summarized by an "average time expectation."

TABLE 2: WEEKLY HOMEWORK TIME EXPECTATIONS IN MINUTES

SUBJECT	NEW YORK CITY SCHOOLS						CONNECTICUT SCHOOLS					
	MATH			READING/ LANGUAGE ARTS			MATH			READING/ LANGUAGE ARTS		
GRADE LEVEL	5	8	10	5	8	10	5	8	10	5	8	10
# of cases	19	34	59	14	37	40	4	14	28	5	7	35
$\bar{x}$	110.4	101.2	134.2	142.3	94.1	103.5	73.0	113.9	147.0	70.0	101.4	142.4
s.d.	38.8	30.6	62.9	86.5	47.5	62.2	22.7	62.2	57.1	51.0	28.5	78.1
V	.35	.30	.47	.61	.51	.60	.31	.55	.39	.73	.28	.55

$\bar{x}$ = mean homework time expectation in minutes

s.d. = standard deviation

V = coefficient of variation

The amount of homework expected increases in absolute amount and as a proportion of class time from 5th through 10th grade in NYC math classes and CONN math and LA classes. In NYC reading-language arts, homework time does not increase in absolute amount compared to the 5th grade level, but its increase as a proportion of class time is more pronounced.

Total homework time in the two subjects averages out to about 50 minutes per day for NYC 5th grades, and about 48 minutes per day for NYC 10th grades. Tenth grade NYC Math classes receive homework assignments which teachers estimate to call for about 27 minutes per day beyond the class period. Since the average 10th grade Math class period in the NYC sample is about 34 minutes of actual subject time out of a modal official period of 40 minutes, the average homework assignment extends the effective class period by about 75%.

TABLE 3: WEEKLY TOTAL STUDENT EXPOSURE TO LEARNING ACTIVITIES IN MINUTES

SUBJECT	NEW YORK CITY SCHOOLS						CONNECTICUT SCHOOLS					
	MATH			READING/ LANGUAGE ARTS			MATH			READING/ LANGUAGE ARTS		
GRADE LEVEL	5	8	10	5	8	10	5	8	10	5	8	10
# of cases	19	34	59	13	36	39	4	14	28	5	7	35
$\bar{x}$	331.4	265.7	300.6	602.9	265.6	271.5	294.3	285.0	335.4	358.0	307.1	314.4
s.d.	59.7	51.0	74.0	227.7	56.8	62.0	70.5	80.4	69.4	212.4	52.9	89.2
V	.18	.19	.25	.38	.21	.23	.24	.28	.21	.59	.17	.28

$\bar{x}$ = mean weekly total student exposure to learning activities in minutes

s.d. = standard deviation

V = coefficient of variation

TABLE 4: HOMEWORK TIME EXPECTATION AS A PROPORTION OF TOTAL TIME ALLOCATED TO SUBJECT MATTER

SUBJECT	NEW YORK CITY SCHOOLS						CONNECTICUT SCHOOLS					
	MATH			READING/ LANGUAGE ARTS			MATH			READING/ LANGUAGE ARTS		
GRADE LEVEL	5	8	10	5	8	10	5	8	10	5	8	10
# of cases	19	34	59	13	36	39	4	14	28	5	7	35
H.T.E./ T.T.A.	.33	.38	.45	.24	.35	.38	.24	.40	.44	.20	.33	.45

H.T.E. = HOMEWORK TIME EXPECTATION

T.T.A. = TOTAL TIME ALLOCATION TO SUBJECT MATTER

Table 3 shows the estimated total student exposure to learning-related activities, both in class and through homework. These totals are calculated for each teacher reporting, and are not merely the sum of the entries in Tables 1 and 2, since class and homework times do not vary in the same way for every teacher, and the number of responses is different for Tables 1 and 2.

The relation between the quantities in Tables 2 and 3 is given in Table 4, which shows the estimated homework time allocation as a proportion of the total exposure to each subject both at home and in class. The NYC Math portion of Table 4 is displayed graphically in Figure 2, which also interpolates the relative shares in grades not surveyed.

The tables just presented answer the first question addressed by this study: What are the average time allocations for student exposure to learning resources in school, through homework, and in total? Most of the responding teachers reported both class time devoted to subject matter and homework time expectations. There is a clear trend in the 293 classes represented here for homework time expectations to increase as a proportion of total school-related activity to about the 40% level in Grade 10. This magnitude seems sufficiently large to justify further analysis of the student time aspect of educational resource allocations.

These same tables tell us how much variation there is in these reported averages. Although there is no conventional standard by which variation can be judged "large" or "small," the coefficient of variation ("V" in Tables 1, 2, and 3) provides a measure of relative variation. Several observations are supported by the data. First, for both data sets, and at each grade level for both Math and LA, the relative variation in homework expectation exceeds that for class subject time in 11 instances out of 12.[22] If time allocation is taken as a measure of opportunity to learn, this means that, on the whole, opportunity to learn is distributed more uniformly during school than for homework. This difference is especially pronounced at the 8th and 10th grade levels, because of the uniformity imposed on class periods by upper grade departmentalization. In these grades, the standard deviations of class time range from a low of 16.9 minutes to a high of 36.4 (Table 1). For the same grades, homework standard deviations range from 28.5 to 78.1 minutes per week. Similar observations apply to the total exposures shown in Table 3.

The magnitudes of these variations are such that assumptions about "average" exposure to learning activities would rest on very shaky foundations. Consider, for example, 10th grade NYC reading-language arts, which has a total exposure standard deviation of 62 minutes (Table 3). From these data (and assuming normal distributions), we can expect about one-third of the students to have total exposure times which differ by more than two hours per week.[23] In fifth grade LA, about one-third of the students would have

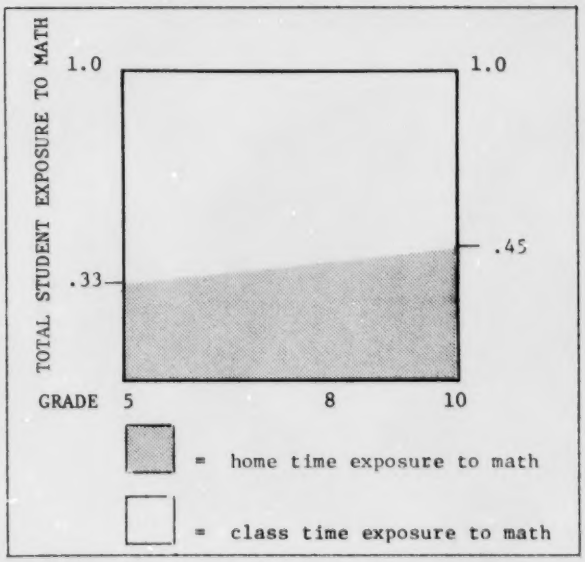

Figure 2. Class and home time as shares of total student exposure to math in New York City.
Source: Table 4.

22 The single exception is CONN 5th grade Math, where the number of cases is only 4.

23 Assuming a normal distribution around the mean, about 68% of students differ in the amount of exposure to learning resources they receive by plus or minus one standard deviation or less. The remainder, about one-third of the students differ in the amount of exposure to learning resources they receive by **more** than that amount: in this case, 124 minutes.

TABLE 5: ANALYSIS OF VARIANCE OF N.Y.C. HOMEWORK TIME EXPECTATIONS BY CLASS ABILITY LEVEL, SUBJECT, GRADE, AND SCHOOL TITLE 1 STATUS

SOURCE OF VARIATION	SUM OF SQUARES	DEGREES OF FREEDOM	MEAN SQUARE	F STATISTIC	SIGNIFICANCE OF F
MAIN EFFECTS	109050.240	5	21810.048	9.578	0.000
ABILITY LEVEL	65558.554	2	32779.277	14.396	0.000
SUBJECT	16148.166	1	16148.166	7.092	0.009
GRADE	33162.051	1	33162.051	14.564	0.000
TITLE 1	1.266	1	1.266	0.001	0.408
2-WAY INTERACTIONS	60779.840	9	6753.316	2.966	0.003
ABILITY LEVEL BY SUBJECT	25182.388	2	12591.194	5.530	0.005
ABILITY LEVEL BY GRADE	16167.266	2	8083.633	3.550	0.030
ABILITY LEVEL BY T1	42405.216	2	21202.608	9.312	0.000
SUBJECT BY GRADE	2.142	1	2.142	0.001	0.429
SUBJECT BY T1	57.372	1	57.372	0.025	0.638
GRADE BY T1	7258.724	1	7258.724	3.188	0.073
EXPLAINED	169830.080	14	12130.720	5.328	0.000
RESIDUAL	318779.010	140	2276.993		
TOTAL	388609.090	154	3172.786		

total exposure times differing by almost eight hours per week, an amount which exceeds the length of an entire school day.

Thus, in answer to the second question addressed by this study, we conclude that variations in class, homework, and total exposure are of sufficient magnitude to warrant attention to the third question: Do the variations systematically correlate with student ability? For purposes of analysis, we will accept the teacher's description of class average ability in lieu of direct measures of student ability or attainment.

TABLE 6: ANALYSIS OF VARIANCE OF CONNECTICUT HOMEWORK TIME EXPECTATIONS BY CLASS ABILITY LEVEL, SUBJECT, AND GRADE

SOURCE OF VARIATION	SUM OF SQUARES	DEGREES OF FREEDOM	MEAN SQUARE	F STATISTIC	SIGNIFICANCE OF F
MAIN EFFECTS	113128.910	4	28282.227	8.174	0.000
ABILITY LEVEL	99652.997	2	49826.498	14.400	0.000
SUBJECT	931.430	1	931.430	0.269	0.605
GRADE	3344.235	1	3344.235	0.966	0.331
2-WAY INTERACTIONS	10856.900	5	2171.380	0.628	0.658
ABILITY LEVEL BY SUBJECT	540.070	2	270.035	0.078	0.463
ABILITY LEVEL BY GRADE	5761.545	2	2880.772	0.833	0.443
SUBJECT BY GRADE	433.096	1	433.096	0.125	0.679
EXPLAINED	123985.810	9	13776.201	3.981	0.001
RESIDUAL	214533.640	62	3460.220		
TOTAL	338519.450	71	4767.880		

Separate analyses of variance were made for weekly subject time in class, for weekly homework time expectations, and for weekly total exposure (the sum of class and homework times). The factors for each analysis were class ability level (below average, average, or above) as reported by the teacher, subject (Math or LA), and grade (5, 8, or 10). For the NYC data set, Title 1 status of the school was also a factor. Since the self-contained NYC 5th grades are not directly comparable to the departmentalized CONN 5th grades, and because of the low N (number) of cases in Conn 5th grades, only the 8th and 10th grade analyses are discussed here.

None of the factors, including ability level, explained the variance in class subject time. Of all the factors, only class ability level was consistent and significant in explaining variation in homework time and, consequently, variation in students' total exposure to learning resources. Tables 5 and 6 chart the homework time data obtained in NYC and CONN, respectively.

Both tables show highly significant main effects, with the largest F-values on the ability factor. In New York City, Title 1 status of the school is not significant as a main effect, but does appear as significant in one of the two-way interaction terms with ability level. More of the "below" average ability classes, and fewer of the "above," were in Title 1 schools. Thus Title 1 status is not important in itself in this study. Rather, it is teacher appraisal of class average ability that has the most significant effect. The size of that effect will be discussed shortly. The R^2, or proportion of total variance explained, is 0.22 for NYC.

For the CONN data, ability level is the only significant main effect, and there are no significant interactions. The proportion of variance in homework time expectation explained (R^2) associated with Table 6 is 0.33.

Overall, these factors account for about one-fifth of the variations in homework time in NYC, and about one-third in CONN. When home and class times are combined to give estimated total exposure ("opportunity to learn"), the comparable analyses explain 16% and 34% of the variation, respectively.

To illustrate the size of the impact of the ability factor on time allocations, a "Multiple Classification Analysis" was constructed for total exposure in the CONN sample. This portion of the data set was selected because there were no significant interactions to obscure the interpretation of main effects. These results are shown in Table 7.

To interpret Table 7, observe that the Grand Mean is 313.67 minutes (per week). The impact of any main effect category is then obtained by adding (or subtracting) the value in Column 2 for that category to the Grand Mean. Thus, a below average ability LA class receives 260.9 (313.67 minus 55.03 plus 2.26) minutes per week exposure to reading-language arts instruction. The above average ability class receives 386.5 (313.67 plus 70.54 plus 2.26) minutes per week. Thus the difference in total opportunity to learn between below and

TABLE 7: MULTIPLE CLASSIFICATION ANALYSIS OF CONNECTICUT STUDENTS' TOTAL LEARNING EXPOSURE IN MINUTES PER WEEK BY CLASS ABILITY LEVEL, SUBJECT, AND GRADE

GRAND MEAN = 313.67 minutes per week		COLUMN 1		COLUMN 2	
VARIABLE & CATEGORY	N	UNADJUSTED DEVIATION	ETA	ADJUSTED FOR INDEPENDENTS DEVIATION	BETA
ABILITY LEVEL					
1 BELOW	19	-56.04		-55.03	
2 AVERAGE	35	-6.47		-6.40	
3 ABOVE	18	71.72		70.54	
			0.58		0.57
SUBJECT					
1 MATH	37	-7.05		-2.14	
2 READING/LANGUAGE ARTS	35	7.45		2.26	
			0.09		0.03
GRADE					
8	18	-19.78		-10.40	
10	54	6.59		3.47	
			0.14		0.08
MULTIPLE R SQUARED					0.343
MULTIPLE R					0.586

above average ability classes is 125.6 minutes (386.5 — 260.9): a difference in excess of two hours. These calculations are of course estimates only, based on an analysis of variance which explains about one-third of actual variation.

Discussion

These results show that for a substantial number of the classes surveyed, student opportunity to learn shows significant, systematic variation. Time in school allocated to subject matter does vary from class to class. Even larger systematic variations are found in the time teachers expect students to allocate for homework. These variations are strongly related to teacher reports of class average ability level. "Lower" ability students receive less total exposure to school learning activities than do "average" students, and both lower and average ability level classes receive less than "higher" classes. If student homework time is counted as a learning resource along with the time students spend in-class with teachers and learning materials, this study's findings suggest that model (c) in Figure 1 comes closest to describing how learning resourses are allocated in relation to student achievement. The anticipated effect of such allocation practices is a widening of the dispersion of subsequent student achievement.

As students progress in grade level, the homework expectation becomes a larger share of student total exposure to mathematics and reading-language arts. This means that increasingly the students' learning-related activities are shifted from the resource environment (and influence) of the school to the resource environment (and influence) of the home. To the extent that student achievement, "ability," as used in this study, is positively related to home background, the expected effect of assigning more homework to the more able students is to amplify the influence of home background on student achievement. This effect is further compounded by the larger share homework plays in total exposure as the student progresses through school.

There are, of course, a number of limitations to this study. The time estimates are based on survey responses, not observations. No "quality" adjustments of any kind were attempted, although some relevant data are available and will be included in subsequent analyses. A large portion of the variation in student exposure to learning resources remains to be explained.

The results presented here, however, suggest the powerful role played by teacher time allocations to learning activities. These allocation practices were found to significantly increase the more able student's opportunity to learn. The results presented here indicate that the educational effects of family background may be partially school effects, in the sense that home influence is reflected and reinforced by schooling time allocation practices. Moreover, because the homework time allocations incorporated here are "hidden" resource allocations, not reflected in the financial resource allocations to schools, this study may help explain, if not tighten, the apparently loose connection between school dollars and school outcomes.

The possibility of there being systematic relations between purchaseable teacher characteristics (experience, training) and the time allocation differences reported here will be discussed in future reports of this work.

ACKNOWLEDGEMENTS: This research was funded in part by a grant from the Spencer Foundation. The assistance of these persons is gratefully acknowledged: Blanche Bailey, Cheryl Kerr, Richard Lowell, Elaan G. Pressman, Mel Shay, Robert Spitz, and the hundreds of teachers and administrators who cooperated in this study. Special acknowledgement goes to Jane Przybysz for her editorial assistance.

1979-80 The Joseph Klingenstein Fellows

PURPOSES The Joseph Klingenstein Fellowships are designed:

- To provide opportunities for independent school faculty and administrators to develop new technical and intellectual skills for use in the classroom, new modes of performance both as teachers and administrators, and new routes to positions of leadership.
- To bring together a group of highly motivated and broadly prepared professionals who will eventually move into positions of educational leadership in independent, private secondary schools.

ELIGIBILITY Any faculty member or administrator (including School Heads) of an independent, private school which has

- a secondary program (even if only the ninth grade is included), and
- A policy of student admissions without regard to race, color, religion, or national origin,

is eligible to apply for the Joseph Klingenstein Fellowships.

NATURE OF THE AWARDS

- In addition to full tuition and fees, Fellows will receive a stipend, an allowance for books and any materials necessary in their program and, where necessary, travel and living allowances in cases where the Fellow must relocate to the New York Metropolitan area.
- We expect the Fellow's school will continue to pay one-fourth of his salary during the fellowship year. (The stipend would represent three-fourths of what the Fellow would have received as salary.)
- We anticipate that most Klingenstein Fellows will spend one academic year at Teachers College. Shorter, one semester programs, however, will be given consideration.
- Fellows may earn up to 30 credits of graduate credit which may be counted towards a degree at Columbia University or elsewhere.
- Applicants should plan to develop some means of sharing the benefits of their fellowship year with their colleagues through publication, workshops or consultation.

HOW TO APPLY Application packets may be obtained from the School Head of your school or by writing:

The Joseph Klingenstein Fellows
Horace Mann-Lincoln Institute
Box 301
Teachers College, Columbia University
New York, New York 10027

*All application materials must be submitted by February 1, 1979. *Fellowship awards will be announced no later than March 15, 1979.

THE METROPOLITAN SCHOOL STUDY COUNCIL CALENDER

1978-1979

Tuesday, SEPTEMBER 19	**MSSC Executive Board Meeting,** 10 a.m.-1 p.m., Greyston, Riverdale
Tuesday, SEPTEMBER 26	Writing Consortium
Monday, OCTOBER 2	Fellows begin field work in schools
Thursday, OCTOBER 5	**Monthly Fellows Meeting,** 4-6 p.m., Greyston, Riverdale
Thursday, OCTOBER 12	**MSSC Principals' Meeting,** 1-3 p.m., Greyston, Riverdale
	School Fellows' Meeting, 4-6 p.m., Greyston, Riverdale
Sunday, OCTOBER 15	Wine and Cheese Party, Open House, 3-5 p.m., Greyston, Riverdale
Tuesday, OCTOBER 17	**Group Skills Work Group,** 10 a.m.-12 p.m., Greyston, Riverdale
	Staff Evaluation Work Group, 2-4 p.m., Greyston, Riverdale
OCTOBER	**Superintendents' Conference**
Tuesday, OCTOBER 31	**Models of Teaching Work Group,** 10 a.m.-12 p.m., Greyston, Riverdale
	Mainstreaming Work Group, 2-4 p.m., Greyston, Riverdale
Thursday, NOVEMBER 2	**Monthly Fellows Meeting,** 4-6 p.m., Greyston, Riverdale
Thursday, NOVEMBER 9	**School Fellows Meeting,** 4-6 p.m., Greyston, Riverdale (Preparation for Fall Conference)
Friday, NOVEMBER 10	MSSC FALL CONFERENCE
Tuesday, NOVEMBER 14	**Staff Evaluation Work Group,** 10 a.m.-12 p.m., Greyston, Riverdale
	Group Skills Work Group, 2-4 p.m., Greyston, Riverdale
	Writing Consortium at Scarsdale
Thursday, NOVEMBER 16	**School Fellows Meeting,** 4-6 p.m., Teachers College
Tuesday, NOVEMBER 28	**Models of Teaching Work Group,** 10 a.m.-12 p.m., Greyston, Riverdale
	Mainstreaming Work Group, 2-4 p.m., Greyston, Riverdale
Tuesday, DECEMBER 5	**Group Skills Work Group,** 10 a.m.-12 p.m., Greyston, Riverdale
	Staff Evaluation Work Group, 2-4 p.m., Greyston, Riverdale
Thursday, DECEMBER 7	**Monthly Fellows Meeting,** 4-6 p.m., Greyston, Riverdale
Tuesday, DECEMBER 12	**Mainstreaming Work Group,** 10 a.m.-12 p.m., Greyston, Riverdale
	Models of Teaching Work Group, 2-4 p.m., Greyston, Riverdale
Thursday, DECEMBER 14	**Fellows Meeting with Ann Lieberman,** 4-7 p.m., Greyston, Riverdale
JANUARY*	School Fellows Meeting to be arranged (T.B.A.)
Thursday, JANUARY 11	**Principals' Meeting,** 1-3 p.m., Greyston, Riverdale
Tuesday, JANUARY 16	**Executive Board** (Superintendents' and Principals') **Meeting,** 10 a.m.-1 p.m., Greyston, Riverdale
Thursday, FEBRUARY 1	**Monthly Fellows Meeting,** 4-6 p.m., Greyston, Riverdale
Friday, FEBRUARY 2	**Regional Meetings** (Bergen County, Connecticut/Westchester County, Long Island)
FEBRUARY*	Work Groups T.B.A., Greyston, Riverdale
	School Fellows Meeting T.B.A.
Thursday, MARCH 1	**Monthly Fellows Meeting,** 4-6 p.m., Greyston, Riverdale
Thursday, MARCH 15	**Principals' Meeting,** 1-3 p.m., Greyston, Riverdale
Tuesday, MARCH 20	**Executive Board Meeting,** 10 a.m.-1 p.m., Greyston, Riverdale
Thursday, MARCH 29	**Superintendents' Conference,** 1:30 p.m., Greyston, Riverdale
MARCH*	Work Groups T.B.A., Greyston, Riverdale
	School Fellows Meeting T.B.A.
Thursday, APRIL 5	**Monthly Fellows Meeting,** 4-6 p.m., Greyston, Riverdale
APRIL*	Work Groups T.B.A., Greyston, Riverdale
	School Fellows Meeting T.B.A.
Thursday, MAY 3	**Monthly Fellows Meeting,** 4-6 p.m., Greyston, Riverdale
Friday, MAY 4	MSSC SPRING CONFERENCE
MAY*	Work Groups T.B.A., Greyston, Riverdale
	School Fellows Meeting T.B.A.
Thursday, MAY 24	**Principals' Meeting,** 1-3 p.m., Greyston, Riverdale
Tuesday, JUNE 5	**Executive Board Meeting,** 10 a.m.-1 p.m., Greyston, Riverdale
Thursday, JUNE 7	**Monthly Fellows Meeting,** 4-6 p.m., Greyston, Riverdale
JUNE*	**Superintendents' Meeting** (Bergen County, Connecticut/Westchester, Long Island); agenda topic: Recruitment
	Visitations and Overall Evaluations — Option II Schools

*Regional Network Meetings announced throughout the year.